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(19) (CA) **CANADIAN PATENT** (12)

(54) Glove Liner

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(73) Majesty (Her) the Queen in right of Canada as
represented by the Minister of National Defence , Canada

(57) 6 claims

NO DRAWING

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ABSTRACT OF THE DISCLOSURE

Fluid impermeable gloves of the type used to handle hazardous chemicals are impermeable in both directions which means that sweat accumulates in the gloves. An accumulation of sweat can result in maceration of the hands leading to a reduction or loss of dexterity. A simple solution to the problem is to insert an underglove or liner in the impermeable glove which absorbs the sweat while not impairing the manual dexterity of the user. The liner includes a thin, perforate layer of a hydrophobic polymeric material such as polyethylene, polypropylene, a polyester or polyacrylonitrile, and a thin layer of an absorbent material such as cotton or a superabsorbent material which does not swell appreciably or collapse when wet for absorbing sweat without adversely affecting dexterity.

This invention relates to a glove liner, and in particular to a liner or underglove for use in impermeable gloves.

Exposure to hazardous chemicals and biological hazards often occur in military and industrial environments. It is
5 necessary to protect the human body from gaseous, liquid and solid chemicals, and biological hazards such as airborne bacteria and viruses. Normally, the body is protected by a suit formed of water vapour permeable material. However, protection of the hands poses special problems. While being impermeable, gloves
10 should be as thin and snug fitting as possible so that they do not impair manual dexterity. Consequently, the bulky materials commonly used in the protective suit cannot be used in the production of gloves.

At present, impermeable gloves are formed of rubber.
15 The gloves are thick enough to provide good puncture and tear resistance. The rubber gives good protection against chemical hazards, and is resistant to oil and solvents. However, because the gloves are impermeable to liquids, they can cause problems in many environments when worn for lengthy periods of time.
20 Because it cannot evaporate or otherwise escape, sweat produced to cool the hands or as a result of nervous tension will condense. The sweat rapidly accumulates inside of the gloves creating a warm, wet environment which may lead to skin maceration, tingling
of the fingers and general loss of feeling in the hand. More-
25 over, manual dexterity can be impaired. Even more than any decrease



in protection afforded by the glove, loss of dexterity imposes a time limit on the duration of glove wear.

One solution to the problem is the use of an absorbent cotton lining, but the lining usually becomes damp after a short term of use, and the skin still remains in a wet environment. Thus, it is readily apparent that there is still a need for a solution to the sweat problem in impermeable gloves.

Accordingly, the present invention relates to a glove liner comprising a thin, water permeable hydrophobic film for placing against the skin of the user; and a thin layer of an absorbent material which does not swell appreciably or collapse when wet, whereby the liner can be used in an impermeable glove to absorb sweat without affecting dexterity.

The present invention is based on the realization that maceration and consequently loss of dexterity would be prevented if the hand could be isolated from the sweat absorbing material. The use of a thin impermeable liner with small perforations therein between the skin and a thin layer of sweat absorbing material achieves this end. The thin, perforate liner permits the passage of sweat to the absorbent layer, and prevents the return of sweat to the hand of the user even when the layers are compressed such as during gripping or twisting (torsion).

The inner layer of the liner, i.e. the thin, water permeable film to be worn next to the skin is formed of a non-woven, hydrophobic polymer selected from the group consisting of

polyethylene, polypropylene, polyesters, such as polyethylene terephthalate and polyacrylonitrile, e.g. the product available under the trademark "Orlon". An example of such a product is described in U.S. Patent No. 3,929,135 which issued to H.A. Thompson
5 on December 30, 1975. This inner layer is sufficiently thin that it does not adversely affect manual dexterity.

The thin outer layer of the liner, i.e. the layer which contacts the inside of the glove is formed of an absorbent material which does not swell appreciably or collapse when wet. The outer
10 layer must be capable of retaining most of its liquid even when compressed. Suitable materials for the outer layer include cotton, polypropylene or a superabsorbent product incorporated in a fabric matrix. The superabsorbent product can be used as a powder dispersed in a fabric or in a foam matrix which would also act as a wicking
15 medium. Superabsorbent products also exist in fibre form in which case the product is so-called nonwoven with other types of fibres which aid wicking. Regardless of the material used, the absorbent layer is designed in such a manner that it never reaches its saturation point in order to comply with the non-
20 swelling requirement and so that there is no release of water when the absorbent layer is under pressure.

Both layers possess minimum stretchability, so that they can be made to fit the hand snugly. The layers must be in intimate contact so that moisture can be transferred through
25 the inner hydrophobic to the outer absorbent layer. The liner can form part of a glove, i.e. define the inner surface thereof

or be used as a discrete glove liner. In this latter case, a protective layer or cover which is similar to the inner hydrophobic layer or which is a thin knitted fabric or a flexible polymeric film such as the material used in surgical gloves, can be provided on the liner, i.e. the liner is formed by an absorbent layer sandwiched between a thin, hydrophobic, perforate inner layer, and a thin, waterproof outer layer. If the liner is used alone, i.e. separate from a glove, the water permeable film and the layer of absorbent material are laminated together, provided that the lamination process does not significantly affect the properties of the materials such as hydrophobicity, water absorbency, dry feel and stretchability. The layers can also be sewn together.

The combination of a perforate, impermeable layer of material and an absorbent layer of material has been used in diapers, sanitary napkins, etc. However, to the best of the present inventor's knowledge, such a combination has never been used to improve the comfort and durability of impermeable work clothing such as gloves.

It will be appreciated that the liner can be used in fingerless gloves, e.g. a weightlifter's glove. In such a glove, the palm and the back of the hands which perspire most would be covered by a sweat absorbing material, leaving the fingers free.

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PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. A glove liner comprising a thin, water permeable hydrophobic film for placing against the skin of the user; and a thin layer of an absorbent material which does not swell appreciably or collapse when wet, whereby the liner can be used in an impermeable glove to absorb sweat without affecting dexterity.

2. A glove liner according to claim 1, wherein said hydrophobic film is a perforated film of a polymer selected from the group consisting of polyesters, polyolefins and polyacrylonitrile.

3. A glove liner according to claim 2, wherein said polymer is selected from the group consisting of polyethylene, polyester, polypropylene and polyacrylonitrile.

4. A glove liner according to claim 1, wherein said absorbent material is capable of retaining absorbed liquid when compressed.

5. A glove liner according to claim 4, wherein said absorbent material is a fabric of a material selected from the group consisting of cotton or a polymer.

6. A glove liner according to claim 1, 2 or 3, including a thin waterproof layer of material for placing against the inner surface of the glove, whereby sweat does not contact the glove.

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